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US 3514899 A
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(54) **Soft toys**

(57) A teddy bear has conductive paws which when held cause the teddy to sing tunes or speak and its eyes to flash. The paws are connected, inside the teddy bear to a voltage source and a current sensor. On sensing a current, an electronic circuit including a microcomputer is powered up to produce the sounds and/or flash the lights. Instead, or as well, as singing, the teddy bear responds to simple spoken commands to flash its eyes or make a noise. Speech is detected by a series of tuned filters and compared with frequency/time patterns contained in an R.O.M.. An arrangement for playing tunes and flashing eyes is also described using discrete circuitry.

GB 2 045 098 A

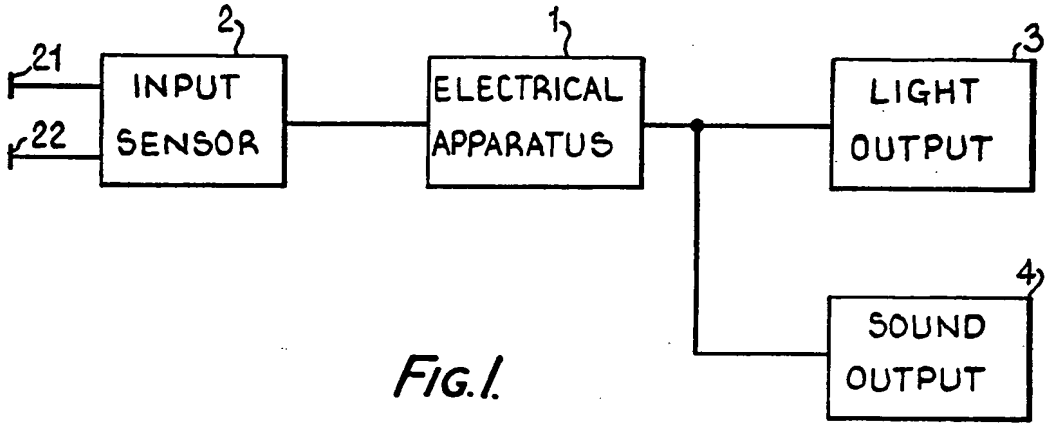

FIG. 1.

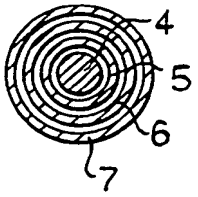

FIG. 2.

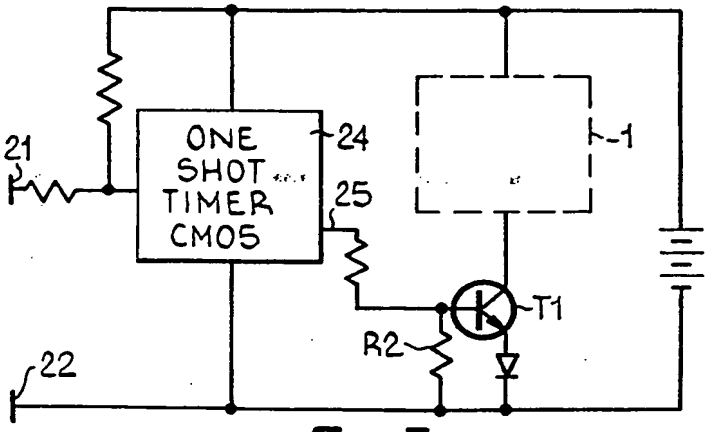

FIG. 3.

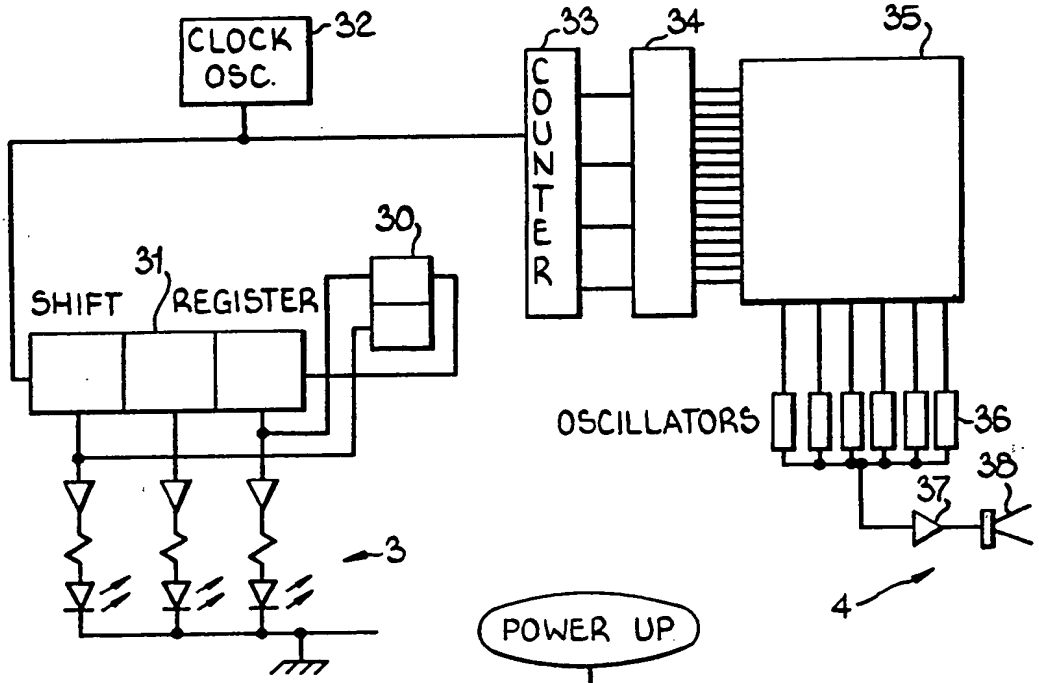

FIG. 4.

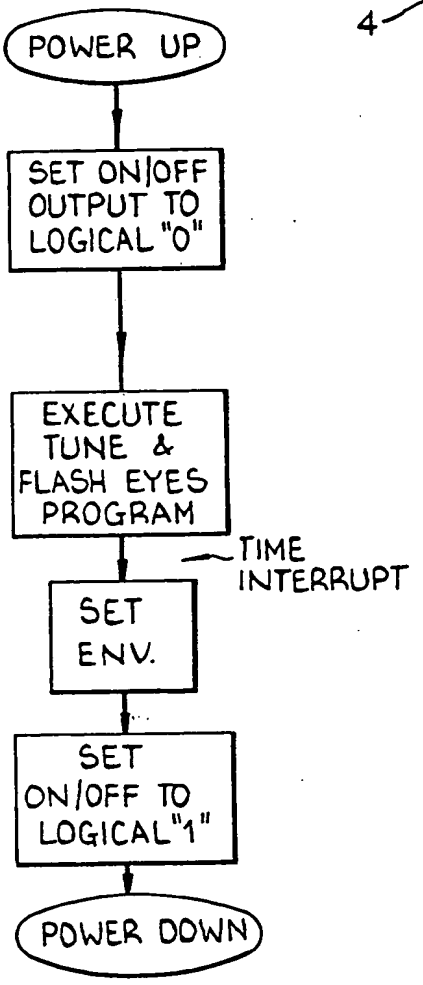

FIG. 6.

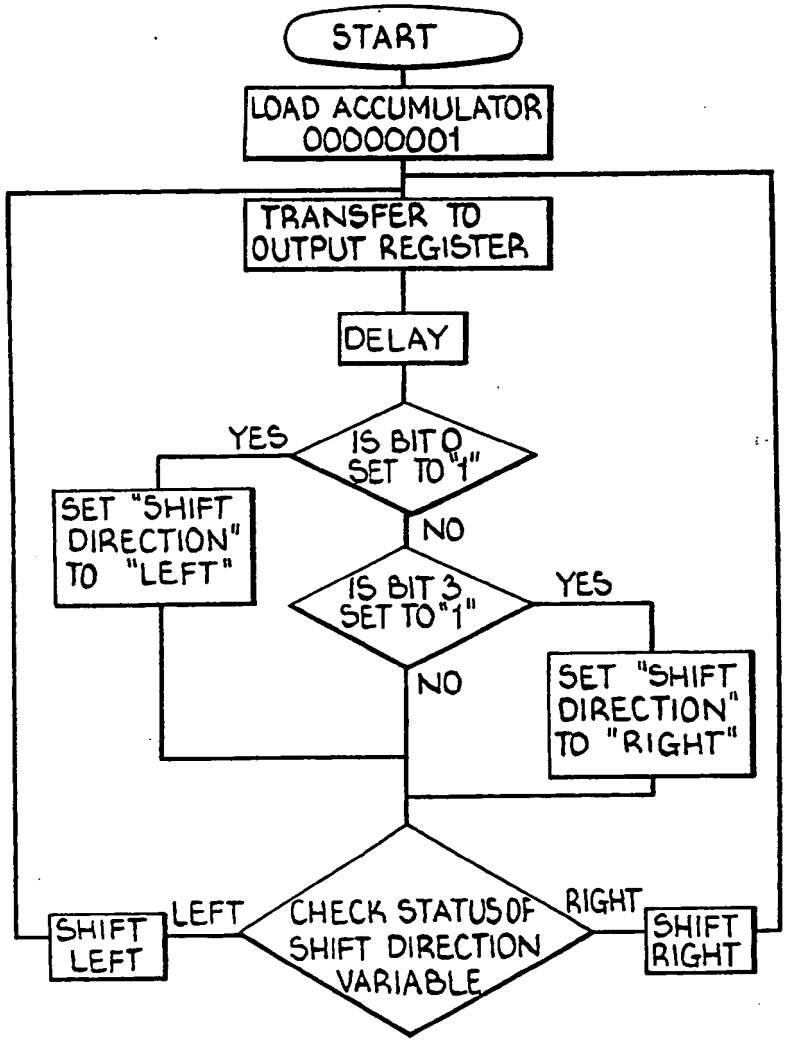

FIG. 7.

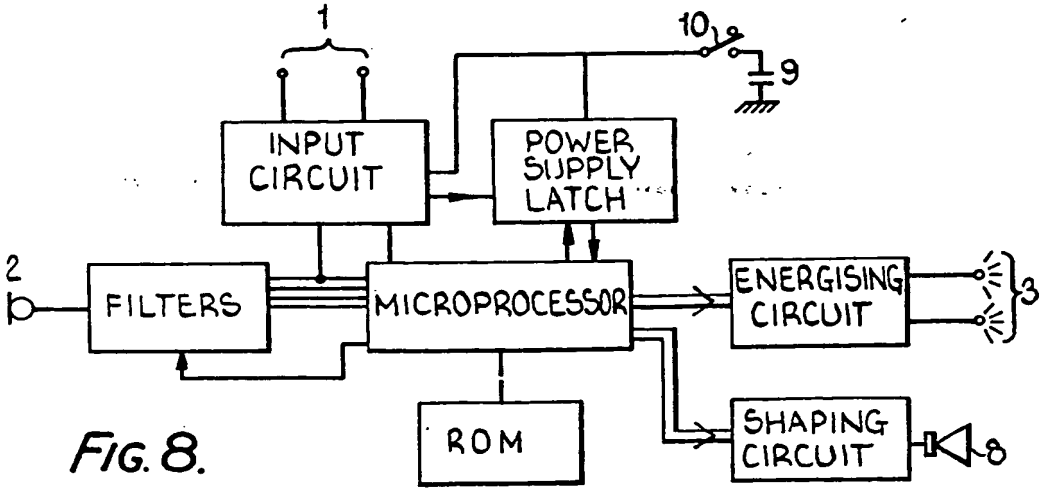

FIG. 8.

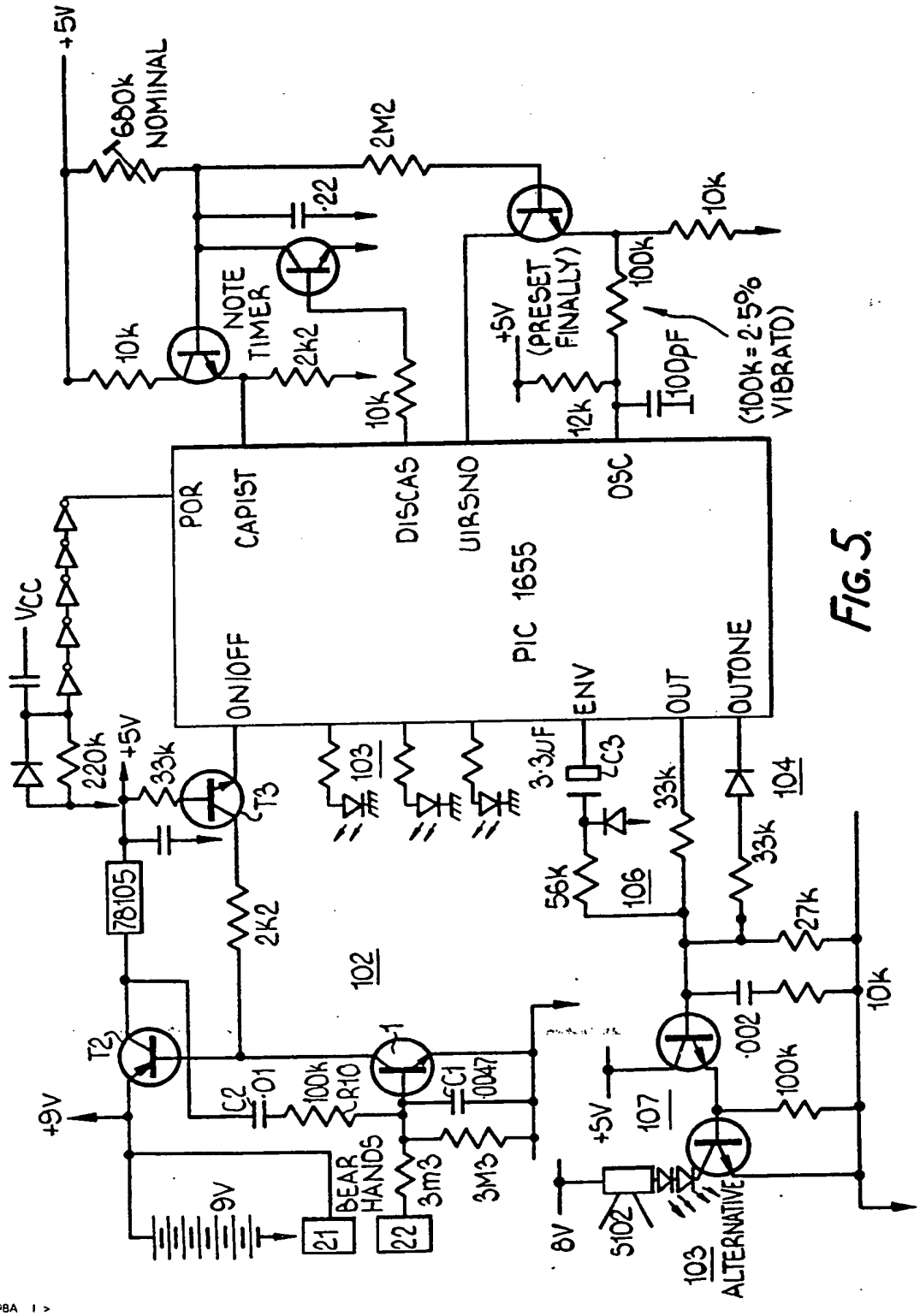

FIG. 5.

SPECIFICATION

Soft toys

The present invention relates to toys, in particular to teddy bears, dolls and other animal toys.

According to a first aspect of the present invention, there is provided a toy including electrical apparatus for producing an electrical signal when energised, soft flexible means sensitive to handling and connected to cause the electrical apparatus to become energised, and transducing means responsive to the electrical signal to produce a user perceivable stimulus.

According to a second aspect of the present invention, there is provided a toy including a component representing an eye, the component having a plurality of light emitting devices, and the toy including means for sequentially selectively energizing and de-energizing the plurality of light emitting devices to produce the appearance of a changing pattern of light in the eye.

According to a third aspect of the present invention, there is provided an animal toy having two conductive means located on respective paws and including means for energizing the toy to produce a user perceivable stimulus on detection of an external electric current flowing between the conductive means.

Instead of, or in addition to, the soft flexible means sensitive to handling, the toy may include means sensitive to a sound, for example, a human speech pattern, connected to cause the electrical apparatus to become energised.

The soft, flexible means may be a sensor that senses a capacity change resulting from the handling, for example, a piece of conducting foil located underneath a layer of fabric connected to the gate of a field effect transistor. It may, alternatively, be a microswitch located below, and activated by pressure on, a soft, flexible pad located on the surface of the toy. A third possible form of the soft flexible means connected to cause the electrical apparatus to become energised may be a pair of conductive areas on the toy. When both areas are touched simultaneous, a small current (of the order of 10μA) is caused to flow through the handler's body, which current is sufficient to cause the electrical apparatus to become energised. Each conductive area may be a conductive layer, for example, a piece of metal foil located below a loosely woven or bonded piece of fabric which is such that the foil may be contacted by the hand of a handler through the interstices in the fabric. Alternatively, each conductive area may be a piece of conductive fabric having conductive filaments woven or bonded into it, or a piece of conductive carbon impregnated foam.

The soft flexible means may be located anywhere on the toy but, where the toy is an animal toy, it is preferably located in the hands or front paws. There may be more than one soft flexible means (or pairs of such means) each for producing a different response from the toy.

The electrical apparatus preferably includes a microprocessor which may have a separate read only memory input connected to it. The microprocessor may include a sufficiently large memory to render a separate read only memory unnecessary.

The transducing means responsive to the electrical signal from the electrical apparatus may produce a sound output, that is to say, it may comprise a loudspeaker, in which case the electrical apparatus should be capable of generating an electrical signal which would cause the loudspeaker to emit a noise resembling the cry of the animal represented by the toy and/or a tune or song associated with the animal. For example, if the toy is a teddy bear, the electrical apparatus may be programmed to generate signals corresponding to "The Teddy Bear's Picnic", and/or a growling noise, or, if the toy is a doll, the electrical apparatus may be programmed to generate signals corresponding to human speech or the noise of a child crying.

Instead of, or in addition to, producing a sound output, the transducing means may produce a light output, preferably from the eyes of a soft toy. The transducing means producing a light output is preferably one or more light emitting diodes (LEDs). The arrangement of the electrical apparatus and the tranducing means may be such that the intensity of light emitted is constant while the electrical apparatus is energised. Alternatively the arrangement may be such that the intensity emitted is varied either in a pseudorandom manner or in accordance with a specific program stored in the electrical apparatus. A particularly attractive effect is produced if an LED representing at least part of an eye is rapidly switched on and off thereby giving the eye a shimmering appearance. If the toy has a sound output, the eyes of the toy may be arranged to light up synchronously with the instantaneous loudness of the sound output.

A particularly attractive form of eye for a soft toy has been found to be a central LED (respresenting the pupil) with one or more circles of light transmissive material concentric with it. The or each circle of light transmissive material is arranged to transmit light from an individual LED that may be lit up independently of the other LEDs, of that eye. The LEDS and/or the light transmissive material may be of a different colour. With such an arrangement an effect of the eye's iris opening and closing can be achieved. The light transmitters may be pieces of shaped plastics material.

Preferably, the arrangement is such that the sound or light output lasts for a predetermined period and, when it has finished, the circuits in the toy are powered down automatically to save battery power. The electrical apparatus may, however, be continuously re-energised by way of the soft flexible means or the sound sensitive means. The toy may also be provided with an on/off switch to provide relief for parents and to switch off the toy when storing it for a long time.

The toy may have a plurality of light and/or sound outputs. The arrangement may be that the various outputs are emitted in a pattern or in a pseudorandom order. Alternatively, the electrical apparatus may be arranged to be energised in response to one of two or more means sensitive to handling or to

sound, in which case, a different light and/or sound output could be emitted depending on which handling or sound sensitive means energises the electrical apparatus.

The animal may be used as a teaching and, for example, as an aid to teaching arithmetic. Thus, the arrangement may be such that, by way of the handling or the sound sensitive means, two signals corresponding to two numbers may be fed to the electrical apparatus and an output corresponding to an arithmetical function of the two numbers may be given by way of the transducing means. For example, a number may be converted into a signal by patting a soft flexible means that number of times. Alternatively, the sound sensitive means may be arranged to detect the sound of each of a plurality of numbers, for example, numbers from one to ten, when spoken and transmit a corresponding input to the electrical apparatus. The output may be given by light emitting means flashing a number of times or by a sound emitting means giving a number of noise outputs or "pips". Alternatively, the electrical apparatus may be connected to a voice synthesizer in which case the animal could "speak" the number corresponding to the arithmetical function of the two numbers.

There will now be described, by way of example only, embodiments of the invention with reference to the accompanying drawings in which:

Figure 1 shows a block diagram of the electrical circuitry of one embodiment of the invention,

Figure 2 shows an end view of a toy eye,

Figure 3 shows part of Figure 1 in more detail,

Figure 4 shows part of Figure 1 in more detail,

Figure 5 shows detailed electrical circuitry of an embodiment using a micro-computer.

Figures 6 and *7* are flow charts of computer programs for an embodiment of the invention, and

Figure 8 is a block diagram of the electrical circuitry of another embodiment.

Referring to Figure 1 a soft toy includes electrical apparatus 1 connected to an input sensor 2 and an light sound output devices 3 and 4 respectively. The input sensor 2 includes a pair of soft flexible conductive contacts (21, 22) situated at an near the surface of the toy. These contacts may be made of a carbon impregnated foam plastics material such as is sold under the tradename.

The input sensor 2 and its relationship with the electrical apparatus 1 is shown in some detail in Figure 3.

Referring to Figure 3 the contacts 20, 21 are connected respectively to the zero volts supply rail 22 and the trigger input of a CMOS 555 timer 24 connected as a monostable multivibrator. The contact 21 is also connected to a pull up resistor which may typically be 10MΩ. The output of the 555 is connected to a the base power transistor T1 the collect or circuit of which contain the electrical apparatus 1.

In the quiesient state of the system the transistor T1 is held in a non-conductive state by base resistor R2. When a person hold both the contacts 20, 21 as small current flows in the resistor R1 which eases the voltage on the trigger input 23 of the timer 24 to fall and trigger the monostable 24 timing cycle. During the timing cycle a logical "1" appears on the output of the timer 25, which turns on the transistor T1 and energizes the electrical apparatus 1. Once the timing cycle is complete the voltage at the output 25 falls to a logical "O" and the electrical apparatus is de-energized. As the monostable is CMOS construction the current consumption in the quiescent state is very low.

The light output device may be the eyes of a toy. One of these is shown in Figure 2. Each eye has a central LED 4 and three concentric rings of possibly coloured plastic light transmissive material 5, 6 and 7. Each ring 5, 6 and 7 is arranged to receive light from a separate LED (not shown) located behind the eye, and to transmit it to the front of the eye shown in Figure 2. By selectively switching the LEDs the opening and closing of the iris of the eye can be simulated.

Referring to Figure 4 the part of the electrical apparatus for driving the light output device 1 includes 3 stage shift register 31 clocked by an oscillation 32.

Each stage of the shift register is connected via a driven amplifier to a respective one of the LED's of each ring of both of the eyes of the toy.

On "switch on" two of the stages of the shift register 31 are set to a logical "0" and one to a logical "1". Techniques for acheiving this are well known. A logical "1" causes its corresponding LED to be illuminated. Each clock pulse from the oscillation 32 causes the logical "1" to shift and hence the LEDs are illuminated in turn. The direction of shift is reversed automatically when the logical "1" reaches either of the end stages of the register by the Flip-Flop 30. This produces the effect of opening and shutting of the iris of the eyes of the toy.

The oscillation 32 is also connected to a four bit counter 33 which may be for example an TTL SN 74 L93 integrated circuit. The outputs of the counter 33 fed a decoder 34 which is in term connected to the address lines of a read-only memory (ROM) 35. The sense lines of the ROM 35 are connected respectively to each of a plurality of tone generator circuits 36, each one of which is tuned to produce a signal corresponding to different musical note. These signals are mixed and fed to a loudspeaker 38 via an audio amplifier 37.

In operation pulses from the oscillator 32 are counted by the counter 33 and produce a parallel output representing the binary state of the count in the counter 33. In response to this the decoder produces a logical "1" sequentially on the 16 address lines of the ROM 35.

When logical "1" appears on an address line and a connection exists in the ROM between the address line and a sense line the sense line also assumes a logical "1" state and in turn energizes its respective tone generator. The number of musical notes possible is limited by the number of sense lines on the ROM note of duration defined by the frequency produced by the oscillation 32. Notes of duration equal to integral multiples of the oscillation frequency can be produced by programming the ROM so that an appropriate number consecutive addresses

operate the same tone generator.

Suitable circuit configurations for ROM's are well known. An example is a diode matrix where each connection is produced by a diode between the address line and the sense line.

In arrangement described with respect to Figure 4 the LEDs of the light output device are sequenced at the same rate as the notes are produced by the sound output device (33, 34, 35, 36, 37, 38). This need not be so if for example a divider is inserted in the connection between the oscillator 32 and the counter 33 on the oscillation 32 and the shift register 31, on it the counter 33 and shift register 31 are driven by different oscillators.

Referring now to Figure 5 a second embodiment of the invention includes a single chip micro-computer PIC 1655. This device is manufactured and sold by General Instruments Corporation and is mask programmable. The circuitry shown in Figure 5 can conveniently be split into an input sensor circuit and power supply switch, the micro-computer PIC 1655 light output circuits 103 and sound output circuits 104.

The input circuits 103 include contacts 121 and 122 which in the example in which the toy is a teddy bear are soft pads of conductive foam plastics material. The contact 122 is connected to the base of a transistor T1, the collector of T1 is connected to base of transistor T2 which is in series with the power supply to the micro-computer PIC 1655 and the output circuits 104 and 103. Also connected to the base of T2 is a transistor T3 the emitter of which is connected to an output ON/OFF of the micro-computer PIC 1655 and the base of which is connected to the supply rail.

In operation when both of the contacts 121 and 122 are touched by the user a small current flows between the contacts through the body of the user and the base-emitter circuit of T1. This causes T1 and T2 to conduct, which "powers" up the rest of the circuitry via the series regulator T 8105. Spurious operation is prevented by a capacitor C1 and positive feedback via the capacitor C2 and resistor R10.

As soon as the micro-computer PIC 1655 is powered up it commences execution of a program contained in an internal ROM. The first few instructions of the program cause a logical "0" to appear on the ON/OFF output and hence cause T3 to conduct. This causes a current to be drawn through the base circuit of T2 which consequently keeps the collector circuit conductive even after the contacts 121, 122 have been released, and hence latches on the power supply.

Figure 6 shows a flow chart of the programme. Once the power supply is latched on the micro-computer executes a tune program. The tune program used is similar to the program used in an integrated circuit tune generator chip sold by General Instruments Corporation under the number AY-1310. Such tone programs are well known in the art, see for example Personal Computer World, Jan 1979, pages 21-23 and Byte Vol 4 No. 7 pp 34-51. Although written for different micro-computers these programs may readily be translated into instructions suitable for the PIC 1655.

Flashing of the eyes of the toy is achieved by illuminating light emitting diodes connected to output terminals of the micro-computer. Many micro-computers for example the PIC 1655 have an output register each individual bit of which appears on a respective output terminal. The register may periodically be loaded from the accumulator. Figure 7 shows a flow chart of a program which will sequentially energise 3 LED's connected to bits 2, 1, and 0 of an output register. Another suitable micro-computer is the INS 8060 with an external ROM where the flag outputs of the status register can be used to drive the LED's. The micro-computer is also programmed to produce a "growl" sound at the end of its tune. This is done by outputting tones close in frequency on separate terminals (OUT, OUTONE) which beat to produce a combination of frequencies. In addition an exponential envelope is given to the tone by outputting a pulse on the envelope output ENV via the capacitor C3 and clamping circuit 106. The tones are amplified by an audio amplifier 107 and fed to a loudspeaker LS.

Referring to Figure 8 the electrical circuitry of another embodiment has a microprocessor connected to a read only memory (ROM) in which is stored a program to cause the system to produce various light and sound outputs. The microprocessor may receive inputs in one of two ways. Firstly, it may receive an input by way of a pair of soft flexible contacts made of carbon impregnated foam plastics material situated near the surface of the toy. When a human holds both the contacts, an electrical circuit is completed and the current in an input circuit causes the microprocessor to actuate a power supply latch and the microprocessor then executes a predetermined program. Once energised, the microprocessor may receive inputs by way of a microphone 2, the output of which is fed into various filters. According to the sound entering the microphone, different outputs are fed from the filters to the microprocessor, which leads to a different signal being generated at the output of the microprocessor. The filters and microprocessor may be such as to produce the appropriate response when voice commends such as "SING" or "GROWL" are given to the toy by a child. The child will quickly learn which sounds the toy will respond to. Details of suitable speech recognition devices and techniques are known in the art and can be found for example in "Give an ear to your computer" by Bill Georgiou of California State University which appeared in BYTE June 1978 Volume 3 Number 6 and the earlier references mentioned therein are incorporated herein by reference.

One pair of outputs of the microprocessor is fed to an energising circuit which control the eyes 3 of the toy, as shown in detail in Figure 2.

A further pair of outputs from the microprocessor are connected to a shaping circuit which controls a loudspeaker 8 to produce a desired sound, tune, song, or other noise as previously described with respect to Figure 5.

The microprocessor is connected to a battery 9 by way of an on/off switch 10 and a power supply latch. The power supply latch automatically powers down

the system after the predetermined light/sound output has finished as long as the microprocessor is not re-energised by way of the contacts 1.

In the block diagram shown in Figure 8, the filters and the power supply latch are shown as blocks separate from the microprocessor, though, of course, they may be incorporated in the microprocessor which then performs their functions.

The detail of the program required to produce the desired output will depend on the type of microprocessor employed, but standard programming techniques for producing outputs simulating noise, musical notes and for producing rhythmic displays of light are available.

Instead of being fed into a microprocessor the outputs from the speech recognition filters could be fed into a clocked R.O.M. and compared with frequency/time patterns stored therein. Such frequency time patterns are described in the referenced article in Volume 3 of BYTE Magazine.

Other useful references are
BYTE June 1978 Vol 3 No. 6 pages 140, 141
BYTE Vol 3 No. 6 pages 142-151
BYTE Vol 3 No. 4 page 147
BYTE Vol 4 No. 4 pages 10-18
BYTE Vol 4 No. 7 pages 34-51
BYTE Vol 4 No. 10 pages 58-69
all of which are incorporated herein by reference.

CLAIMS:

1. A toy including
electrical apparatus for producing an electrical signal when energised,
soft flexible means sensitive to handling and connected to cause the electrical apparatus to become energised, and
transducing means responsive to the electrical signal to produce a user perceivable stimulus.

2. A toy according to claim 1 wherein the soft flexible means includes a conductive foam plastics material.

3. A toy according to claim 1 wherein the soft flexible means includes a conductive foil located in soft non-conductive material.

4. A toy according to claim 1 wherein the soft flexible means includes conductive filaments in the material of the skin of the toy.

5. A toy according to any preceding claim wherein the soft flexible means includes two flexible conductive elements so arranged that they are urged into contact during handling of the soft flexible means.

6. A toy according to claim 1, 2, 3 or 4, wherein the soft flexible means includes two conductive areas and each area is arranged so that on handling an electrical connection is formed to the body of the handler.

7. A toy according to any preceding claim wherein the user perceivable stimulus includes light.

8. A toy according to any preceding claim wherein the transducing means includes a plurality of light emitting devices.

9. A toy according to claim 8 wherein the transducing means includes light transmissive elements coupled to respective ones of said plurality of light emitting devices and arranged to produce a pattern of light perceivable through a surface of the transducing means.

10. A toy according to claim 9 wherein the electrical apparatus includes means for sequentially energizing the light emitting devices to change the pattern of light.

11. A toy according to claim 9 or 10 wherein the light transmissive elements are co-axial at the surface of the transducing means through which the pattern is perceivable.

12. A toy according to claim 6 including sensing means connected to each of the flexible condutive elements for sensing an electric current flow between the elements and for energizing the electrical apparatus in response thereto.

13. A toy according to any preceding claim wherein the user perceivable stimulus includes sound.

14. A toy according to claim 13 wherein the electrical apparatus includes means for causing the transducer means to produce a predetermined sequence of musical notes.

15. A toy according to claim 14 wherein the sequence is determined by the contents of a read-only memory.

16. A toy according to claim 1 wherein the electrical apparatus includes a microprocessor and a read-only memory.

17. A toy according to claim 16 wherein the microprocessor and read-only memory are contained in a one-chip micro-computer.

18. A toy including a component representing an eye, the component having a plurality of light emitting devices, and the toy including means for sequentially selectively energizing and de-energizing the plurality of light emitting devices to produce the appearance of a changing pattern of light in the eye.

19. A toy according to claim 18 wherein the eye component includes a plurality of light transmissive elements each associated with a respective light emitting device and arranged to present a plurality of rings at the surface of the eye and the means for energizing and de-energizing energises and de-energises adjacent rings in sequence.

20. An animal toy having two conductive means located on respective paws and including means for energizing the toy to produce a user perceivable stimulus on detection of an external electric current flowing between the conductive means.

21. A toy according to claim 1 including timing means for de-energizing the electrical apparatus after it has been energised for a predetermined time.

22. A toy according to claim 1 including sound sensitive means for altering the electrical signal in response to sound sensed by the sound sensitive means.

23. A toy according to claim 22 wherein the sound sensitive means includes at least one frequency sensitive circuit for sensing within a predetermined frequency band and transmitting an indication to the electrical apparatus that that particular sound has been sensed.

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24. A toy according to claim 23 wherein the sound sensitive means includes a plurality of frequency sensitive circuits each for sensing within a different predetermined frequency, and recognition means for recognising particular sequences of frequencies.

25. A toy substantially as herein described with reference to the accompanying drawings.

New claims or amendments to claims filed on 9.6.80
Superseded claims –
New or amended claims:-

26. A toy including
electrical apparatus for producing an electrical signal when energised,
an electrical contact of a soft and flexible electrically conductive material connected to the electrical apparatus and arranged so that a current flow through the contact causes the electrical apparatus to become energised, and
transducing means responsive to the electrical signal to produce a user perceivable stimulus.

27. A toy according to any one of claims 2 to 17 and 21 to 24 wherein the soft flexible means sensitive to handling and connected to cause the electrical apparatus to become energised is an electrical contact of a soft and flexible electrically conductive material and arranged so that a current flow through the contact causes the electrical apparatus to become energised.

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Dec. 27, 1927. 1,654,068

D. G. BLATTNER

APPARATUS FOR THE VISUAL INTERPRETATION OF SPEECH AND MUSIC

Filed Oct. 6, 1925

Fig. 1.

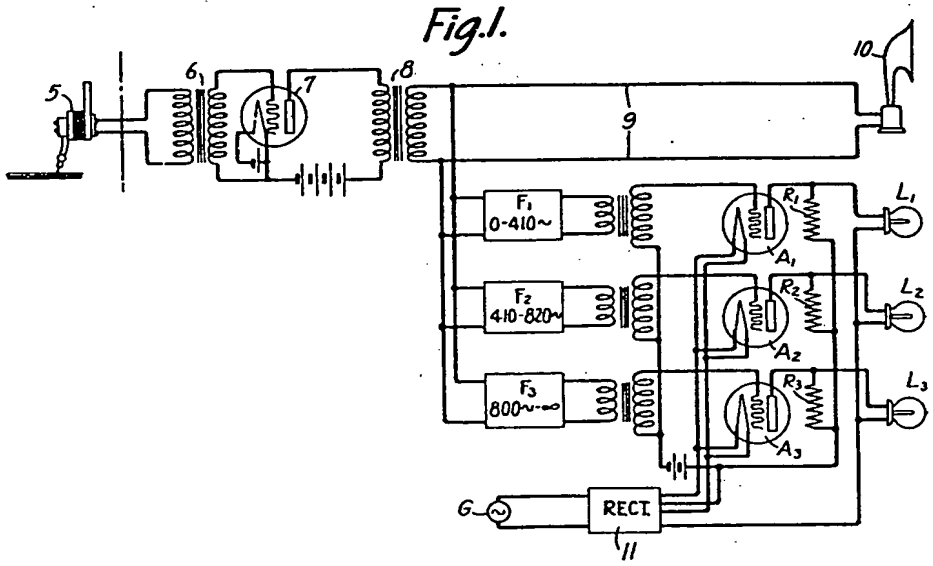
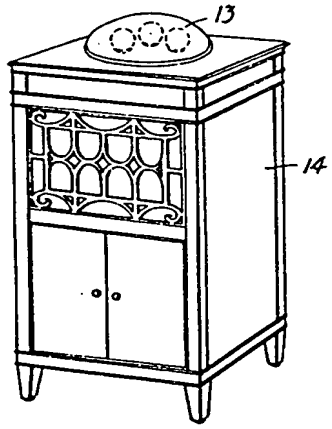


Fig. 2.



Inventor:
David G. Blattner

by E. W. Adams Atty

Patented Dec. 27, 1927. 1,654,068

UNITED STATES PATENT OFFICE.

DAVID G. BLATTNER, OF BOGOTA, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

APPARATUS FOR THE VISUAL INTERPRETATION OF SPEECH AND MUSIC.

Application filed October 6, 1925. Serial No. 60,716.

This invention relates to apparatus for the visual interpretation of acoustic effects such as are derived from electrical sound reproducing systems.

An object of the invention is to facilitate the interpretation of speech and music with the aid of electrical illumination.

A related object of the invention is to produce lighting effects which blend in harmony with the articulate sounds produced by a phonograph or other sound reproducing system.

The invention provides means for accentuating the artistic effect produced by musical and other programs whose themes suggest various degrees of light and color. The invention may be employed, for example, in systems of the type disclosed and claimed in a copending application of E. B. Craft, Serial No. 60,715, filed October 6, 1925, in which a portion of the energy in an electrical sound reproducing system is utilized to produce complementary tones and shades of light and color.

In the system disclosed in the Craft application, the illumination produced by a plurality of colored lamps is varied in accordance with the characteristic frequencies and intensities of the sound wave energy in such a way that a variation in intensity of the light from a maximum brilliancy to complete darkness may be obtained according to the sound produced. According to a feature of the present invention, means are provided for controlling the light produced in such a system in such a way that the illumination will never fall below a predetermined minimum intensity.

The various features and advantages of the invention will appear from the following description and the accompanying drawing, in which:

Fig. 1 is a circuit diagram of a phonograph reproducing system embodying the invention.

Fig. 2 is a perspective view of a cabinet phonograph equipped in accordance with the invention.

In Fig. 1, a phonograph reproducer 5 is coupled through a transformer 6 to an amplifier 7, the output of which is coupled through a second transformer 8 and circuit 9 to an electrically operated loud speaker 10. The reproducer 5 may be of any suitable type, such as the electromagnetic reproducer disclosed and claimed in a copending application of H. C. Harrison, Serial No. 66,624, filed November 3, 1925. The reproducer 5, when actuated by a phonograph record, as illustrated, generates electrical currents which drive an electromagnetic motor element of the loud speaker 10 of any well known construction in accordance with the record. The volume level of the reproduced speech or music may be controlled in any well-known manner, as by adjusting the amplifier 7 to control the electrical input to the loud speaker.

A plurality of channels, including wave filters F_1, F_2 and F_3, respectively, are associated with the circuit 9. The output side of the filter F_1 is coupled to an amplifying detector A_1, which may be of the space discharge type, having an incandescent lamp L_1 connected in its output circuit. Similarly, detector A_2 and lamp L_2 are connected in circuit with the filter F_2, and detector A_3 and lamp L_3 are connected in circuit with filter F_3.

The several wave filters employed in the system are designed to freely transmit a preassigned range of frequencies and to effectively suppress all frequencies lying outside of such range. Filter F_1, for example, may be a low pass filter transmitting all frequencies from zero to 410 cycles, and suppressing all other frequencies. Filter F_2 may be of the band pass type, designed to transmit frequencies of 410 to 820 cycles, and filter F_3 may be a high pass filter transmitting all frequencies above 800 cycles. These filters may be designed in accordance with the principles set forth in the U. S. patent to Campbell No. 1,227,113, issued May 22, 1917.

The generator G and rectifier 11 constitute a common source of space current and filament heating current for the amplifying detectors A_1, A_2 and A_3, and also serve to supply energy to the lamps L_1, L_2 and L_3. A grid polarizing battery 12 is connected in common to the cathodes of the several detector tubes.

In operation, a small portion of the energy in the circuit 9 of the loud speaker will be selectively transmitted by one or more of the filters F_1, F_2 and F_3, to the input circuits of the respective detectors, depending upon the frequency and intensity of the trans-

mitted energy. The energy thus impressed upon the input circuit of any detector will cause an increase in the space current in the associated output circuit, thus lighting the associated lamp to a brilliancy depending upon the intensity of the received energy.

According to a feature of the invention, an auxiliary circuit is provided for lighting the lamps L_1, L_2 and L_3 to a predetermined minimum brilliancy. As illustrated, the resistance elements R_1, R_2 and R_3 are connected in series with the common source of space current and in parallel with the anodes of the respective space discharge devices A_1, A_2 and A_3, thus forming a plurality of closed loop circuits, each of which includes the common source of space current supply, a lamp and the associated resistance element. The lamp L_1, for example, is normally energized over a circuit including the rectifier 11, the filament of lamp L_1, and resistance element R_1, thus causing this lamp to glow to a predetermined intensity when no energy is supplied from the circuit 9 to the channel including the filter F_1. The lamps L_2 and L_3 are caused to glow in a similar manner. When energy from the circuit 9 is transmitted to a given channel, however, space current will flow in the associated detector circuit to establish a low impedance path for the respective lamp.

It will be seen from the above that the intensity of illumination may be varied in insensible gradations from a minimum to a maximum brilliancy in harmony with the sound variations produced by the loud speaker 10. If desired, the lamp L_1, which is controlled by the lower frequencies, may be colored red, while the lamp L_2, controlled by the intermediate frequencies, may be colored green, and the lamp L_3, controlled by the higher frequencies, may be blue. These particular colors are arbitrarily associated with the various frequency bands, but a definite relation may, of course, be established in keeping with the use to which the invention is put. A greater variety of color tones may also be obtained by employing a greater number of channels and differently colored lamps.

In Fig. 2 a plurality of electric lamps, each controlled by a predetermined band of frequencies, are clustered together inside an opalescent bowl 13 mounted on a cabinet phonograph 14. The lamps may also be mounted in many other artistic arrangements either with or without a diffusing screen.

The invention is, of course, susceptible of various other modifications not specifically referred to but included within the scope of the appended claims.

What is claimed is:

1. In a system for visual interpretation of acoustical effects in combination, a source for generating sound wave frequencies, a sound reproducer, a circuit operatively associating the sound reproducer with the sound wave generator, a plurality of lamps associated with the circuit and selectively responsive to intensity and frequency of currents in said circuit, and means for limiting the minimum intensity of the light from the lamps.

2. In a system according to claim 1, auxiliary means for lighting the lamps to a predetermined minimum brilliancy.

3. In a system for visual interpretation of acoustical effects in combination, a source of sound wave frequencies, a sound reproducer, a circuit operatively associating the source of sound wave frequencies and the sound reproducer, a plurality of lamps, a detector for each lamp having its output circuit associated with the lamp and its input associated with the circuit connecting the source of sound wave frequencies and the sound reproducer, and auxiliary means for continually supplying current to the lamps.

4. In a system for the visual interpretation of acoustical effects in combination, a source of sound wave frequency, a sound reproducer, a circuit connecting said source with said reproducer, a plurality of space discharge devices having their inputs associated with said circuit, a source of light individual to each of the space discharge devices, a resistance individual to each of said lights, and a source of space current common to said lights, resistances and space discharge devices.

5. In a system according to claim 4 in which the light sources are included in series with the outputs of the space discharge devices and the common source of current and resistances are included in shunt of the lights.

In witness whereof, I hereunto subscribe my name this 5th day of October A. D., 1925.

DAVID G. BLATTNER.